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First guns, then pills---next big research investment will be in brainpower, says U-M professor.

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SAN FRANCISCO---For decades, research related to military security got the lion's share of federal funds. Then, as the Cold War ended and baby boomers hit middle age, investment shifted toward life sciences research, with its emphasis on cancer, aging and other health matters. Over the next 50 years, expect to see another major transition, toward investment in intellectual capital, or brainpower, says James Duderstadt, president emeritus and professor of science and engineering at the University of Michigan. Duderstadt spoke during a panel discussion titled "Science Policy: The Next 50 Years" at the annual meeting of the American Association for the Advancement of Science.

"My contention is that as the baby boomers get older and die off, we'll come to realize that the dominant national priority---and the dominant global priority---for the 21st century will be intellectual capital," says Duderstadt. "Ideas are the key to the new economy, and educated people produce the ideas."

But what are the best ways to produce educated people? That's where research---and research funding---is needed, Duderstadt says. "Today, while we invest $20 billion a year in the National Institutes of Health and $5 billion a year in the National Science Foundation, we invest less than a couple of hundred million a year in research on

education. So I think it's time that we consider new models for ramping up very rapidly the investments in understanding how people learn and how learning institutions are designed."

The efforts that encouraged defense-related research in the 1950s and 1960s might serve as a model, Duderstadt suggests. "The difficulty that we have right now is that the best minds in the country are not focused on this as an area of research. The role that the Defense Advanced Research Projects Agency (DARPA) played in the 1950s and 60s was to focus the top scientific talent in the nation on research related to national security. In a similar way, we need to engage the research enterprise in concentrating on this new priority."

Indeed, the Committee on Science, Engineering and Public Policy of the National Academy of Sciences---of which Duderstadt is a member---already is looking at ways to promote education research and recently discussed strategies with the director of DARPA.

Duderstadt envisions a broad, multidisciplinary effort that goes beyond the kinds of research typically done in schools of education. Researchers in cognitive psychology, the neurosciences, organizational theory, engineering, chemistry, physics, mathematics and other disciplines all could help fill the void in understanding how best to help future generations learn.

"Right now, the knowledge base is limited . . . but beyond that, the translation from fundamental research into practice is even more limited," Duderstadt observes. "One of my colleagues once said that if doctors were to use scientific knowledge the way

teachers do, they'd still be treating patients with leeches. And part of the reason is that there really have not been robust research programs in this area."

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